

The Standard Laboratory Module (SLM™) and Standard Analysis Method (SAM)

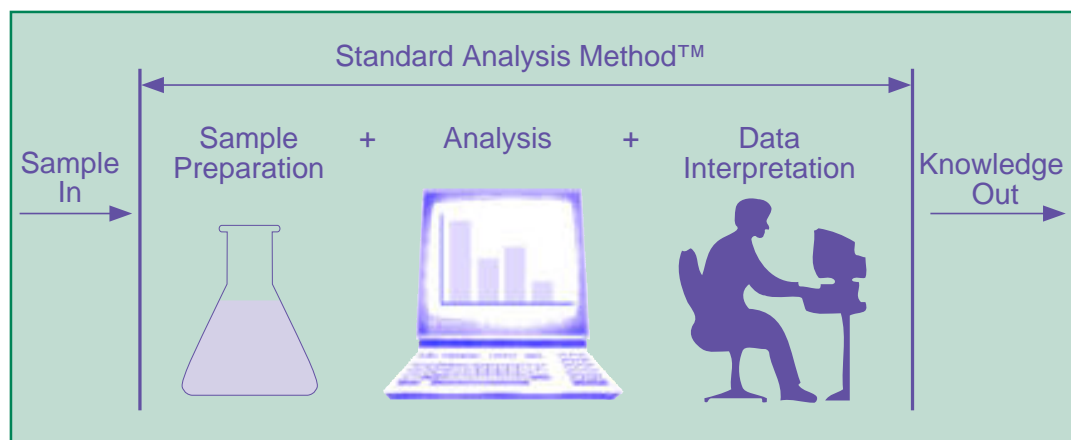


Figure 1. The SAM concept.

The Contaminant Analysis Automation (CAA) Paradigm

The accomplishment of the CAA Program mission and goals required the development of an SLM™ to provide screening and analytical sample analysis for the Department of Energy (DOE) and its contractors. The SLM™ is an instrument standardized in both its software and hardware characteristics that automates a portion of a complete analytical method. Some of the first methods to be automated are the Environmental Protection Agency's methods 3540 and 3550, the Soxhlet and sonication extraction of semivolatile organics (specifically PCB's) from soils. Particular SLMs™ might automate aspects of sample introduction, sample preparation, or once a sample has been analyzed, the interpretation of raw data.

As the figure shows, classical laboratory sample analysis can be divided into three functions: sample preparation, sample analysis, and data interpretation. The CAA team is developing modules for sample preparation and data interpretation only. Analysis instruments available commercially can be integrated directly into our systems with minor modifications and are not a development focus for the CAA team. We envision that, in time, the CAA Program will develop over 40 SLMs™ in close cooperation with the CAA systems integrator, SciBus Analytical, Inc. of Sunnyvale, California, and other industrial partners.

Laboratory managers will then have a suite of SLMs™ from which to construct specific integrated systems, known as SAMs, to automate a specific sample analysis from

sample-in to interpreted data out. To fully automate sample analysis, the SAM system includes a sophisticated robotic control program, a graphical user interface, a secured chain-of-custody and object-oriented database, and knowledge-based data interpretation modules. In the near future DOE customers as well as those in private industrial laboratories can approach SciBus to assemble SAMs specific to their needs, enclose the systems for safety, train the users, and provide upgrades.

SLMs™ can be integrated into the automated SAM system in a plug-and-play fashion, which means that these instruments can be added to or removed from a SAM system as needs dictate without compatibility problems or significant downtime. Each SLM™ must meet rigorous criteria to ensure that it is compatible with the CAA standardization paradigm in both hardware and software attributes.

An Upward Migration Path

The CAA team recognized that environmental laboratories may not require fully integrated systems to realize significant benefits from the SLM™ standardization scheme. To provide these laboratories with this automated technology, the CAA Program standards ensure that SLMs™ can operate in a standalone mode. Laboratory managers may realize significant benefit by operating several copies of the same SLM™ in their laboratories in a standalone mode without having to justify the cost of a fully integrated system. This blend of manual and automated sample processing can provide significant increases in data quality and throughput, especially when a chemical technician uses several SLMs related to the same method.

The CAA Program's Market Relationship

The CAA team has made a strong commitment to use existing technology in the private sector whenever possible. Instrumentation vendors that have technology compatible with the CAA standards have been and will be used wherever possible. Our standardized modules will provide prevalidated SLMs™ and SAM systems that are guaranteed ready for installation and immediate sample processing without further testing. The performance of this technology will be certified as a result of meeting the criteria required to achieve the SLM™ certification mark.

We also envision that our modules will be manufactured by multiple vendors, including the systems integrator. This organization brings the best talent available in the marketplace to bear on the CAA technology design and the ability to fold in other single-vendor systems that are more esoteric.

SLM™ Standards Development

Over the past five years the CAA team has continually developed the SLM™ standards with input from practicing environmental chemists, regulators, and standards organizations such as the Consortium on Automated Analytical Laboratory Systems within the National Institute of Standards and Technology. In the future, with the advantage of expertise gleaned from PTI, the manufacturability and commercialization aspects of this standard will mature.

For further information, please contact: Mosaic
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Standard Laboratory Module (SLM™)

- is a logical combination of laboratory unit operations
- performs a subtask within a protocol
- can be either hardware or software
- conforms to well-defined standards
- interacts with a supervisory control system for integrated operations
- can function independently in a standalone operation
- can be combined with other modules to form SLMs™ of greater complexity

Standard Analysis Method (SAM)

- is a plug-and-play system
- is flexible
- incorporates intuitive human/computer interface
- provides legally defensible archived data
- uses a sophisticated database

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